A STUDY OF TWENTY-ONE CONSECUTIVE AMBULATORY BACK INJURIES, WITH SPECIAL REFERENCE TO FRACTURES OF THE SPINE.

By H. W. SPIERS, *Los Angeles*

The frequency of bone injury to the spine.

The infrequency of malingering.

The necessity of careful clinical study of the injured back.

The value of stereoscopic and lateral x-ray examination of the suspected area, and above it.

DISCUSSION *by E. W. Cleary, San Francisco; D. I. Aller, Fresno; C. E. Early, Los Angeles.*

FROM May 1, 1922, to October 1, 1923, I examined fifty-five back injuries. All were ambulatory patients. A large majority were men. All but a few had been seen and studied by from one to several surgeons. In the main, their diagnoses were not very definite. Of the fifty-five patients, twenty-one were found to have a definite spine injury, as shown by the x-ray examination. It is these twenty-one with bony injury that I wish to discuss.

About half of them were referred by physicians; the remainder were referred by the Industrial Accident Commission. Thus, the man with the injured back is frequently seen by the orthopedic surgeon as referee. Some of these individuals are keen type of men, but the most of them are of the class among whom one would hardly expect a clever malingerer. Of the series examined, none was proven a definite malingerer. That a good many exaggerated their symptoms I am certain, but all had some basis for their complaint. A number showed no signs definite enough to warrant a diagnosis of serious injury. In others, whose previous diagnosis had been "neurosis" or "railroad spine," I was able to demonstrate definite bone injury.

A careful history, an orderly examination, including intelligent x-ray study, goes a long way toward getting to the root of the trouble.

In the history, the type and manner of the injury should be given consideration. The distance of a fall may not be of as much importance as of the way in which the individual landed or of the object upon which he landed. I found it fairly common to find a crush fracture of a body of the lower dorsal or upper lumbar spine when the fall was such as to cause the man to land on his upper back and shoulders. This is reasonable when one considers that a bow breaks most frequently near its middle, not at its end. Fractures of muscular violence are not unusual. The individual in the bent-forward position lifting a heavy object, who slips or is suddenly forced to carry more than his muscles are mechanically able, frequently fractures parts of his spine. Fractures of the transverse processes are frequently from muscular violence. Usually there has been a rotary violence also. The articulating facets occasionally give way under similar violence, in my opinion.

An orderly examination includes an inspection of the entire back, with the patient entirely stripped. The position and attitude of the head and shoulders should be noted. The normal curves of the spine and their variations if any, should be checked up. The weight line of the body, both lateral and anteroposterior, is of importance. A study of the function of each of the segments of the spine should be made. It is to be remembered that the greater part of the motion of the spine takes place in the lumbar region. Here forward, lateral and backward movements, as well as rotations, have the widest range. Limitation of movement in this region is much more easily demonstrated than in the upper and middorsal segments, but even there careful observation will demonstrate it if present. It is my custom to palpitate the spinous processes and the area lateral to them throughout the entire spine. Deep pressure over the injured vertebra is liable to produce marked subjective symptoms. If there is an injury to the transverse process, as one would expect, active movements which involve the muscle groups attached will produce symptoms, while passive movements will usually be painless. An injury to the articulating facet localizes itself if a study of the signs, symptoms, and function of the segment involved is made. I feel that injury to these facets is more frequent than is generally recognized. Rotary, muscular or direct violence, if the leverage is right, will frequently result in fracture. Fractures of the body of the vertebrae may give symptoms similar to any of the other types of fractures. I think it is only just to say that there are crushing injuries to the bodies of the vertebrae which cannot be demonstrated early, but which on later examination show the definite wedge shape that is so characteristic. The probable explanation is that the body was damaged and its structural strength impaired, giving way gradually under the superimposed weight of the trunk.

Stereoscopic x-rays are of much more value in demonstrating the lesser bony injuries to the spine than the flat plates. Lateral views are essential in the study of the spine, and we are only just beginning to appreciate the value of these. All examinations were made with the aid of the Bucky diaphragm. Certain films which had previously been taken of these patients were seen. Some were simply poor plates, which, of course, eliminate good diagnosis. Others were not well localized, the region of the injury had not been included, and many where the injuries were included were flat plates in which the injury of the lesser processes could not be demonstrated. A good lateral view of the spine until recently has been a difficult thing to secure. Many of them are altogether inadequate. It is my experience that one is likely to localize the injury lower than it actually is. One must keep in mind that referred symptoms radiate downward in all spine injuries. In other words, have your x-ray study include several vertebrae higher than the supposed injury, as indicated by the findings. A mistake to avoid is trying to cover too large an area in the individual film. After one's study has been carefully made, the region of the injury can usually be indicated to the radiographer and a clearer knowledge of the bony structure thereby obtained.

Some of the outstanding clinical facts noted in

this series were: the importance of muscle spasm, the value of studying with the range of motion of all segments of the spine, and the comparative rarity of definite evidences of nerve lesions. It is my opinion that definite muscle spasm means definite pathology. An injury to the spine almost invariably limits the motion of the segments to some degree. The point of maximum subjective symptoms during palpation is usually taken as the clue to the segment that should be most thoroughly studied. It is not difficult to make a diagnosis of a fractured spine if one has evidences of definite cord or root lesion, or a good lateral view and sees a wedge-shaped vertebra. It is more difficult, however, to account for some of these injured spines that have the lesser bony processes only involved. These usually have at most only referred pain as evidences of nerve disturbance and can be demonstrated only by the most clear-cut films and painstaking study.

Regarding malingerers: A study of the table of cases shows that, out of twenty-one, six were definitely said to be malingerers. Of the remaining fifteen, practically all were thought to be exaggerating their symptoms. I am definitely of the opinion that we, as surgeons, have made many grevious mistakes in our diagnosis of the neurotic spine. Since x-rays show that the lesser processes of the spine are frequently damaged and that compression fractures are not at all infrequent, due even to muscular violence, one must admit that this proposition has a great deal of basis of fact. It does not seem reasonable to me that an individual whose earning capacity is far greater while at work than when laying off, receiving insurance or individual compensations, might, for some imaginary or minor disability, greatly exaggerate his symptoms.

The points I wish to bring out are:

1. The frequency of bony injury to the spine.
2. The infrequency of malingering.
3. The necessity of careful clinical study of the injured back.
4. The value of stereoscopic and lateral x-ray examination of the suspected area and above it.

No. 1—M. V., 28 years old. Injured April 6, 1921. He was injured by lifting a weight of about fifty pounds in an awkward stooped position. Examined twelve months later. Previous diagnosis, sprain of the low back. He complained of low back pain, which radiates down the left leg. The pain is relieved by rest, and increased by exertion. Examination showed limitation of movement and muscle spasm in the low back. X-ray findings show a rotary luxation of the fifth lumbar vertebra on the sacrum, and a fracture of the right sacral articulating facet; also impingement of the left transverse process of the fifth lumbar vertebra on the iliac crest.

No. 2—A. R. P., 54 years old. Injured August 10, 1921, by falling from a building a distance of fifteen feet, landing on his upper back. Examined nine months later. Previous diagnosis, neurosis. He complained of constant pain in the low back, which radiated downward to the region of the left knee; also pain in the lower abdomen. There was evident limitation of movement in all directions in the region of the upper lumbar and lower dorsal vertebrae and marked muscle spasm. X-ray examination showed a compression fracture of the bodies of the second, third, and fourth lumbar vertebrae with bony overgrowths.

No. 3—J. C., 69 years old. Injured December 7, 1921, by being struck by an electric trolley car, suffering a broken jaw, broken ribs, and injured back. Examined ten months later. Previous diagnosis, as regards the back, was neurosis. He complained of backache on standing and walking. Examination showed marked muscle spasm throughout the entire low dorsal and lumbar spine, with marked limitation of flexions in the lumbar regions. X-ray findings showed a fracture of the transverse processes of the second and third lumbar vertebrae.

No. 4—C. O., 38 years old. Injured September 25, 1922, by being crushed by a mass of falling dirt. Examined one month later. Previous diagnosis, contusion and sprain of the back. He complained of pains in the left hip, thigh, and lower leg. There was marked muscle spasm in the low lumbar region and slight limitation of movement in that region. The x-ray findings showed a fracture of the transverse process of the fifth lumbar vertebra.

No. 5—H. E. B., 33 years of age. Injured November 30, 1921, by an automobile body falling on him, causing numerous abrasions and injury to the cervical spine. Examination made one year later. His complaint then was stiffness in the cervical spine, sensitiveness and discomfort on movement of the spine which radiated down the left arm, and to a less extent down the right arm. Previous diagnosis, hypertrophic arthritis. Examination showed limitation of motion in the cervical spine. X-ray examination showed a crush fracture of the bodies of the fourth and fifth cervical vertebrae, with slight backward displacement of the fifth.

No. 6—B. M. B., 54 years of age. Injured August 29, 1922. He fell twelve feet from a scaffolding, striking on his right shoulder and head. Examined three months later. Previous diagnosis, concussion of the brain and sprain of the neck. His complaint now is of constant pain and stiffness of the neck and shoulder. Examination showed marked limitation of movement in the cervical spine below the second cervical, with considerable atrophy of the muscles of the left shoulder. X-ray findings show a compression fracture of the bodies of the fifth and sixth cervical vertebrae and sprain fracture of the body of the fourth and fracture of the superior posterior angle of the right scapula.

No. 7—A. B., 35 years old. Injured March 2, 1922, by being caught in the door of a cotton press, and his shoulders and back pressed violently together. Examined nine months later. Previous diagnosis, neurosis. He complained of pain in the back between the shoulders. This pain radiated forward, greatly increased by lifting and bending. There is bilateral muscle spasm in the middorsal region, and slight limitation of motion in the dorsal spine. X-ray examination shows a rotary disturbance between the sixth and seventh dorsal vertebrae. The descending articulating facet on the right side showed evidences of an old fracture.

No. 8—C. E. P., 64 years old. Thirty-five years prior to examination he fell and was laid up for three months. He gradually improved and returned to work. Has had no particular difficulty until seven months ago, when he fell and struck a step and had a return of his symptoms. Examined April 17, 1923. Previous diagnosis not made. He had been treated by manipulations, with exaggeration of symptoms. The objective symptoms were marked limitation of movements throughout the entire lower dorsal and lumbar spine and muscle spasm. The x-rays show an old fracture of the bodies of the eleventh and twelfth dorsal and first and second lumbar vertebrae, with proliferative arthritis of the first and second lumbar vertebrae. It is felt that, in all probabilities, that the original injury was thirty-five years ago, and that the present injury was a fracture of the fusion between the first and second lumbar vertebrae which the x-rays seemed to demonstrate.

No. 9—A. T. H. Injured February 21, 1923. Examined two months later. Twenty years previous he had a serious injury in a wreck in which his spine was hurt. He was laid up for many months. This injury took place while lifting a heavy weight. No previous diagnosis had been made. He complained, at time of examination, of pain in the middorsal region, which extends downward and forward. Herpes zoster developed, but did not relieve the pain. The scars of the rash were present and marked muscle spasm in the dorsal region. The x-rays showed a compressed fracture of the fifth, sixth, and seventh dorsal vertebrae. There was marked callous formation.

No. 10—H. J. S., 60 years old. Injured April 13, 1923,

in a cave-in of earth. Examined two months later. Previous diagnosis, back strain. He complained of pain in the lower back when stooping or lifting. If he was quiet he was fairly comfortable. The objective symptoms showed marked muscle spasm. There was a structural curve of the spine and limitation of all movements of the lumbar spine. The x-ray showed a sprain fracture of the body of the third lumbar vertebra and a fracture of a superior articulating facet of the fourth lumbar vertebra.

No. 11—J. R., 55 years of age. Injured January 29, 1923, by having a truss fall on him, striking him in the back. Examination made five months later. Previous diagnosis, hypertrophic arthritis. He complained of chronic pain in the low back. The pain was increased by exercise and movement. The objective symptoms were limitation of motion of the entire spine and muscle spasm in the same region. X-ray examination showed a separation of the fused hypertrophic process on the right side between the third and fourth lumbar vertebrae.

No. 12—R. B., 33 years of age. Injured January 20, 1923, when he fell from a scaffolding, striking on his back on a plank. Examined six months later. He complained of backache and headache. The lower dorsal and lumbar spine showed marked muscle spasm. There is a very marked exaggeration of the lumbar lordosis. Previous diagnosis, neurosis. X-rays show a crush fracture of the bodies of the eighth, ninth, and tenth dorsal vertebrae.

No. 13—J. C. G., 34 years of age. Injured May 19, 1923. While lifting a kettle of hot fat weighing about ninety pounds he slipped, and in his effort to throw the fat away from him so as not to scald himself he injured his back. Examined two months later. He complained of pain in the low back and right hip, and of discomfort on forward bending and lifting. Examination showed marked muscle spasm throughout the lumbar region. There was a structural curve of the spine which seemed to be a left dorsal, right lumbar curve. All movements of the lower spine were guarded. X-ray examination showed a fracture of the transverse process of the third lumbar vertebra and of the vertical articulating facet of this same vertebra on the same side.

No. 14—L. W. M., 39 years old. First injured July 9, 1921. At that time he was struck by a freight elevator door while he was standing in the forward flexed position. He was disabled for a number of weeks, but gradually got around, although for a period of one year he complained of back pains. He recovered, however, until he was doing a normal day's work. On March 21, 1923, while in a similar flexed position he was hit in the same region by a truck. He had a similar pain as in the previous injury, and since that time had been unable to work. Examined four months after the second injury. He complained of pain in the low back. The previous diagnosis in each case had been sprain. Objectively, his back showed marked muscle spasm from the middorsal region to the sacral region. The x-ray examination showed a vertical fracture through the lamina of the fourth lumbar vertebra to the right of the spinous process; also a healed similar injury to the fifth lumbar vertebra. In this case it was our opinion that the fractures occurred at the time of the original injury, but the condition was reopened by the second.

No. 15—F. R., 49 years of age. Injured July 9, 1923, by falling into a hopper, with one leg extended and the other flexed, landing on his back on a hard, projecting pipe. Examined two weeks later. Examination showed marked limitation of flexions and extensions of the lower spine. The lumbar and low dorsal muscles were in marked spasm. Previous diagnosis, sprain. X-ray examination showed a crush fracture of the body of the first lumbar, with fracture of the inferior articulating facet of the third on the right side; also a fracture of the lamina on the right side of the second lumbar vertebra.

No. 16—H. H. P., 41 years of age. Injured December, 1922, while endeavoring, with an assistant, to lift a crossbar of steel weighing about three hundred pounds. His assistant slipped, throwing the entire weight on him. Examined nine months later. Previous diagnosis, sacro-iliac slip. He had been manipulated several times—last time under ether—following which he was very much worse. Objectively, his spine showed an extreme list to the right, exaggerated lumbar lordosis and marked muscle spasm from the sixth dorsal vertebra downward and limitation of motion in the lumbar spine. X-ray examination showed an old fracture of the transverse processes of the fourth lumbar vertebra.

No. 17—W. A. C., 28 years old. Injured in 1918 from a fall from an airplane. Examined August 3, 1922. He complained of chronic low back pain on the left side which had been constant since injury. Objectively, there was muscle spasm and limitation of motion in the lumbar region. Previous diagnosis has been neurosis. He had been treated for a long period on this basis in the army hospital. X-rays showed a compression fracture of the first lumbar vertebra and lesser evidences of a compression fracture of the fifth lumbar vertebra.

No. 18—J. P. K., 34 years of age. Injured in a motor-car accident four years ago. Examination made April 6, 1923. He complained of backache intermittently since his injury. Examination showed muscle spasm and limitation of lateral movements of the spine. Previous diagnosis, strain. X-ray findings showed an old compressed fracture of the first lumbar vertebra.

No. 19—J. C. H., 84 years old. Injured March 28, 1923, by falling in the bathroom. He fell in such a way that he was doubled up between the wall and the tub. Examined the next day. He complained of acute pain in the low back. There was marked muscle spasm throughout the entire dorsal spine. He was unable to lift himself up or stand except with great difficulty. The spine sagged laterally, and there was a beginning kyphus. X-ray examination showed a crush fracture of the bodies of the first and second lumbar vertebra.

No. 20—J. D., 30 years old. Injured May 5, 1923, by being struck in the back by a crowbar. Examined four months later. Examination showed marked muscle spasm and limitation of motion of the back. He complained of back pain. Previous diagnosis, sacro-iliac strain. X-ray examination showed a forward luxation of the fifth lumbar vertebra on the sacrum.

No. 21—J. L. S., 33 years old. Injured November 12, 1922, by muscular violence, lifting with a severe twist. Examined in consultation one week later. Diagnosis of fracture of superior articulating facet of the fifth lumbar was made. Two days later was seen by another surgeon, who disputed diagnosis and manipulated the spine without result. Again seen three months later. X-rays showed definite callous development about the fractured facet.

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DISCUSSION

E. W. CLEARY, M. D. (177 Post Street, San Francisco)—Dr. Spiers has brought to our attention a number of points of major significance in investigating back injuries.

My experience has led me to conclude that actual malingering is rare, but exaggeration quite common as a complication of back injuries. Carelessness and lack of precision in the examination of back injuries have contributed to bring about a bad situation. The individual who desires to exploit someone through the compensation law has come to believe that he may readily do so by claiming disability associated with a lame back.

Definite physical signs are, I believe, always present in instances of disabling back injury. It is up to every surgeon who assumes the responsibility of passing opinion upon such a patient to make sufficiently thorough investigation, including x-ray examination to discover the physical signs present. In the absence of physical signs, I believe, that symptoms alone can safely be accepted as proof of disability only in instances where there is an unquestionable history of actual severe and unusual stress having been brought upon the spinal column.

I have not yet seen a compression fracture of a vertebra which I am sure was due to a lifting strain. I have seen several such fractures, which had been attributed to lifting strain, but in every instance careful inquiry discovered a history of a previous severe fall or crushing accident, which, in my opinion, accounted for the vertebral distortion credited to the more recent lifting strain. I would like to ask Dr. Spiers how many compression fractures of vertebrae he has seen which were unquestionably the result of lifting strain.

D. I. ALLER, M. D. (Mattei Building, Fresno)—I have

read with interest Doctor Spiers' excellent paper on fractures of the spine, and I find that he has stressed many points upon which I insist in all severely traumatized backs.

In all spine injuries one never is too careful or exacting in determining the exact nature of the fall, crush, or body position at time of accident.

In my experience, both as to private cases, industrial cases and in work at the General Hospital, there has always been clinical evidence of sufficient moment to warrant a thorough investigation in the x-ray laboratory.

The anomalies of the fifth lumbar vertebra are in some instances apt to be misleading, and may result in an incorrect diagnosis.

It has never been my privilege to see a compression fracture of a vertebra due to a lifting strain; however, do not understand that I question such a possibility in spines weakened from disease or previous injury.

C. E. EARLY, M. D. (Golden State Hospital, Los Angeles)—This paper presents several interesting points. The more proficient we become in the examination of injuries and the interpretation of x-rays, the less malingering we see. Exaggeration of existing symptoms is not uncommon. This is especially noted in back injuries, and is due to a faulty psychological impression often induced by the surgeon. The surgeon treating back injuries should explain, in detail, the condition to his patient, giving him as good a prognosis as possible. A fractured vertebra should never be called a "broken back." Correct mental stimulation is good therapy in back injuries.

Careful, painstaking study and examination with the clothing entirely removed is essential. Examine the entire body. Focal infections and pre-existing diseases are oftimes an important factor in diagnosis, treatment and prognosis. Rectal examination should always be made. I believe that spinal fractures will show definitely localized symptoms. When my patient is unable to localize his pain and rubs his hand over a considerable area of his back, I look upon the case with suspicion. Careful x-ray study is of greatest importance. Stereoscopic and lateral views should be had. It is unfortunate that we are unable to secure lateral views of the upper dorsals, but it is seldom that a compression or crushed fracture occurs in that region.

I have never seen a crushed fracture due to strain, nor do I recall having seen a fractured transverse process due entirely to strain unless it were a very small avulsed chip from the tip of the process. I do not believe a healthy vertebral body was ever fractured entirely by straining. Fractured transverse processes do not cause prolonged disability. The disability ordinarily does not exceed sixty days. In only two cases have I removed fractured transverse processes for continued pain. If I examined a painful back several months after injury and found only fractured transverse processes, I would conclude that there was other cause for the pain.

Impingement of the transverse processes of the fifth lumbar on the iliac crests is more theoretical than real. It seldom if ever occurs unless the process is malformed. Examine a skeleton and note the distance between the process and the ilium; also note the downward and backward curve of the iliac crest. Fractures through the articular processes and facets are rare, but probably occur in many cases where they are not demonstrable by the x-ray.

The percentage of cases that show nerve symptoms is small, unless the crushing has been severe. In these cases the nerve symptoms generally follow immediately upon the injury. In a few cases of compression of the body of a dorsal vertebra I have found pain due to pressure on the nerve root referred around the rib to the front of the chest. Fractures of the fifth lumbar often refer pain down the legs by irritation or pressure on the lumbo sacral nerves.

Remember, in examining back injuries, that we see few spines that are entirely normal. These injuries usually occur during the years of our active working life, and by that time most of us have some deviation from the normal. Remember, also, that there is considerable normal variation in the width of the vertebral bodies.

DOCTOR SPIERS (closing)—Regarding compression fractures due to muscular violence, I have seen one which was unquestionably due to such. Several husky mechanics were testing their lifting ability at a garage. The champion, to demonstrate that he could lift still more, endeavored to lift a weight of about eleven hundred pounds. While in the extreme effort he suddenly cried out in pain and practically "froze" in the position in which he was standing. He was taken immediately to a hospital where x-rays films disclosed a compression fracture of the body of a vertebra. There was no bony pathology present causing any particular weakness to the spine.

Fractures of the transverse processes, in my experience, do cause long periods of disability at times. I have frequently found them among the hardest of cases to give symptomatic relief. I attribute this to the fact that the nerve trunks lie directly anterior to these processes.

I appreciate the discussion this paper has brought forth.

CALIFORNIA ASSOCIATION OF PHYSIOTHERAPISTS

(Reported by Beret Stenvig, secretary San Francisco Branch)

The San Francisco branch of the California Association of Physiotherapists held its meeting on March 11 in the form of a general discussion by the members of the association, with a very interesting and stimulating exchange of ideas on physiotherapy practice.

The next meeting will be on Wednesday, April 8, at 8 p. m. at St. Luke's Hospital, Twenty-seventh and Valencia. Richard W. Harvey, M. D., will speak on the use of hydrotherapy in the treatment of neurasthenia. Following Dr. Harvey's talk, the technician at St. Luke's will give a demonstration in the physiotherapy department.

The Family Doctor as a Community Asset—One of the inducements that leads to the setting up in a small village of a doctor's office is the rendering of service for hire. He locates in a community and grows up with the country and the people. He has succored them in sickness and in sorrow, has battled their diseases, rescued them in their accidents, warned, cheered and exhorted them. *He has been one of them.* He has not only been their physician and surgeon, he has assumed and earned a place of responsibility in their lives, and his interests have become so entwined and thought-bound with theirs that he is in the position of friend and counselor, and he not only is a country doctor, but he remains a country doctor.—Austin Flint, Iowa Medical Journal.

A Convalescent and Rest Home for Nurses—A group of New York women have purchased ten acres of land and provided suitable buildings, personnel, and financing for a convalescent and rest home for nurses. What a beautiful and worthy thought! The earning life of a good nurse is short, and the future after her active usefulness is too problematical. Even at the wages they now charge and to which many unjustly object, these worthy servants of the health of others cannot, even by practicing thrift, provide against the day when they can no longer earn a living. The well-thought-out plan now taking shape in New York might well interest benefactors of mankind elsewhere.

"Syphilis," says the Public Health Service, "may be held responsible for 52 per cent of all the deaths resulting from heart trouble, or 88,417 fatalities. When this sum is added to the 15,811 deaths credited to syphilis by the census figures, the result is a total of 104,228 deaths caused by syphilis directly or indirectly, and this total is arrived at without taking into consideration deaths caused by some other diseases which are in many cases a result of syphilitic infection. Experiments recently made in Paris would seem to indicate that 76 per cent of syphilitics have heart trouble."